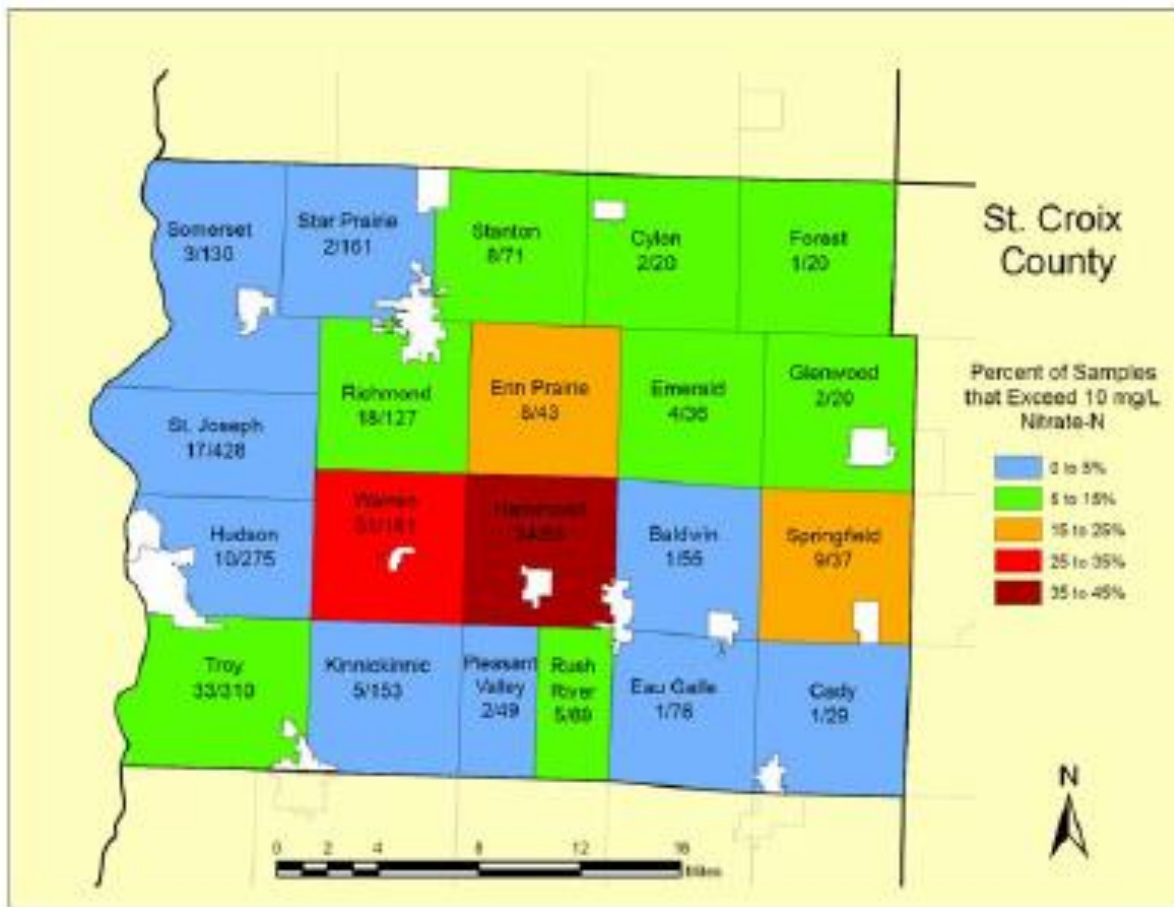


APPENDIX D  
GROUNDWATER RECOMMENDATIONS REPORT

# Prioritized Recommendations from the Ground & Surface Water Quality Study Report



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#### Project Prioritization

CDD reviewed and prioritized the water quality study report recommendations according to the over-arching goal of the Groundwater Study Group, *“To provide the St. Croix County Board with sound science-based recommendations for policies that protect the quality of groundwater supply that our County residents rely upon for personal household use and consumption.”* CDD prioritized the recommendations according to the above goal and the adjacent Action Priority Matrix. The priorities were scored by impact and effort involved. Effort involved includes estimated project cost.

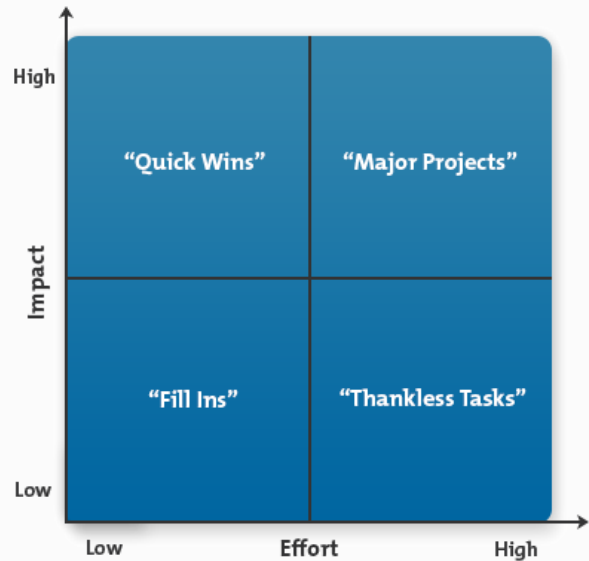
The short-term immediate priorities are specific to advancing the understanding of groundwater quality changes; sources of nitrate pollution, whether human, animal, or commercial fertilizer; groundwater flow in karst aquifers and mapping of environmentally sensitive areas in order to make science-based recommendations for policies that protect groundwater. These priority recommendations include groundwater staff, water quality tests, consultant fees for remote sensing and study of karst aquifers and calibration of the groundwater flow model, and mapping of sensitive groundwater recharge areas. Without this information, it will be difficult to determine the benefits of policy changes implemented through the long-term recommendations.

The short-term immediate priorities include the reclassification of an existing CDD administrative assistant position to Water Resources / Marketing Specialist. It is anticipated that this position would dedicate about 60% of their time to groundwater related activities. The position will be the project coordinator for the drinking-water well-testing program and be responsible for coordinating resources to accomplish the tasks associated with the priority recommendations. The position will be the point of contact for groundwater education, outreach and emergency response.

The long-term recommendations include new ordinances and revisions to existing ordinances. County Board efforts to advocate at the state level for changes to statute and administrative rule to allow the county to regulate beyond the state minimum standards would likely be both short-term and long-term. Changes to statute and administrative rule could include:

- Allow counties to obtain private water sample test results for the protection of public health
- Changes to NR 151, to include St. Croix County karst aquifer bedrock in performance standards that exceed general state standards, similar to the changes for karst Silurian bedrock
- Require nitrate removal systems for POWTS in karst aquifers through revisions in state statute and Administrative Code DSPS 383.
- Increase well casing and grouting standards for wells in karst aquifers through revisions in state statute and Administrative Code NR811 and 812.
- Require water treatment systems, reverse osmosis, nitrate removal, and UV treatment for bacteria in karst aquifers and areas with high test results for new construction and replacement through revisions in state statute and Wisconsin Uniform Building Code.

Figure 1 – The Action Priority Matrix



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Implementation of rule changes and ordinances could require additional county staff.

The document table of contents outlines the priority of tasks and projects as determined by CDD staff. The chart below lists CDD priority recommendations and a proposed timeline. The priorities are separated into short-term or immediate recommendations and long-term recommendations. For purposes of these recommendations one CDD full time employee salary and benefits is estimated to cost \$90,000, one Corporation Counsel employee salary and benefits is estimated to cost &130,000

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Short Term / Immediate Recommendations				
Timeline	Project Priority Order	#	Resource	Estimated Costs
2018-2019	Sinkhole Mapping	2.A	Consultant	\$21,000 Funded
2018	Reclassification of Existing Position 0.6 FTE of position Water Resources	3.A	1.0 FTE Co Staff	~0.6 FTE \$53,000 annually ~\$13,000 annual budget increase over existing
2019-2029	Water Quality Screening Clinic	1.C	Co. Staff	
2019-2029	Baseline Water Quality Analysis	1.A	Tests	\$10,000 annually
2020	Nitrate Source Analysis	1.B	Tests	\$22,000
2018-2019	Emergency Response Protocol to Potential Pollution Events	3.B	Co. Staff	
2018-2019	Emergency Response Bacteria Testing Policies	3.C	Co. Staff	
2019	EVAAL Study Kinnickinnic Watershed	2.E	Consultant	\$12,000
2020-2022	Karst Aquifers, Groundwater Flow Model, Groundwater Recharge and Environmentally Sensitive Areas Mapping	2.B, 2.C, 2.D	Consultant	\$75,000 -\$150,000
<b>Total Annual Cost</b>	Water Resource Staff, Baseline Testing			~\$63,000 annually
<b>Total One-Time Projects</b>				\$55,000-\$200,000

Long- Term Recommendations				
Timeline	Project Priority Order	#	Resource	Estimated Costs
Ongoing	Increase Acres in NMP	4	1 New FTE	\$90,000 annually
Research Mid 2024 Implementation 2025	Revise Land Use Policy Zoning Ordinances Agricultural Shoreland Management Ordinance County Administration of State Well Code	5	1 New FTE Ag 1 New FTE Well	\$180,000 annually \$8,000 ordinance development
Research mid 2024 Implementation 2025	Livestock Operations and Licensing Ordinance(s)	6	1 New FTE Ag 1 New FTE Legal	\$220,000 annually \$20,000-\$30,000 ordinance development
<b>Total Annual Cost</b>			5 New FTE	\$490,000 annually
<b>Total One-Time Projects</b>			Ordinance Development	\$28,000-\$38,000

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*Priority 1. Develop a scientifically sound drinking water well testing program to expand baseline data in order to measure drinking water quality over time.*

#### Baseline Water Quality Testing

The Community Development Department (CDD) and Public Health will partner to develop a scientifically sound drinking water well testing program to expand baseline data in order to measure changes in drinking water quality over time. The program will focus on measuring nitrates and bacteria. The results will educate and assist rural homeowners and policy makers in developing informed decisions regarding private wells, water treatment, land use, and regulation.

Public Health has contacted the Eau Claire City-County Health Department Lab. The Eau Claire Lab can accommodate 200 tests per year @ ~\$50 per test for Nitrates and bacteria. The sample number and test schedule will need to be determined with the Eau Claire lab to avoid staffing concerns and conflict with other tests. CDD will use its existing well and drinking-water testing program database to identify potential well owners. These wells will have a Wisconsin Unique Well ID, construction log, and have an accurate spatial location suitable for this program. We will consult with Wisconsin Geological and Natural History Survey and United States Geological Survey geologists on best locations for these wells. CDD will contact the identified well owners to provide information to them regarding the long-term testing program, data use, and testing procedure.

The program will strive to test 200 wells each year, for five years, for 1,000 individual wells tested at the end of five years. One thousand wells is 6% of the existing ~16,000 wells in St. Croix County. In the 6<sup>th</sup> year, the cycle will begin again with tests on the first 200. The 1,000 wells tested in five years shall be spatially located to provide countywide coverage of well tests.

Private well drinking water testing often occurs as part of real estate property transfer and home inspections. This well testing data would add significantly to the county baseline data and allow drinking water quality trends and geographic areas of concern to be identified more quickly. Currently, water test samples are sent to the person requesting the inspection. Advocating at the state level to allow counties to receive private water sample test results would need to be pursued by the County Board.

The baseline water quality test program may not be the appropriate testing program for bacteria. Bacteria in groundwater and wells is temporal in nature, and is highly dependent on snow cover, snowmelt, rain events, and manure spreading activities. It will need to be determined how many tests the Eau Claire lab can perform when bacteria may be present in samples. A separate bacteria-testing program should be developed to respond to brown water events.

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#### Timeline

**August 2018:** Arrange a meeting between Eau Claire City/County Health Department Environmental Health, St. Croix County Community Development, St. Croix County Public Health to share goals of project, discuss timeline and logistics.

**September - October 2018:** Meet with Community Development to identify dates for nitrate screening event(s), develop plan for outreach to private well owners, and identify educational materials.

**November – December 2018:** Outreach to private well owners.

**February – April 2019:** Collect water samples (65 samples in February, 65 samples in March, 70 samples in April). Well owners will receive their own results and be provided with guidance and education if results are abnormal.

**May – June 2019:** Compile data and create database. Share results with stakeholders.

**July 2019:** Develop plan for sustainability of project.

#### Nitrate Source Analysis of Drinking Water Wells with High Nitrates.

In areas of the county with high nitrates, perform a nitrate-source analysis on a representative sample of drinking water wells. A nitrate source analysis can determine whether the source of nitrates is human, animal, or commercial fertilizer. The increase of rural homes and rural residential subdivisions with septic systems, CAFO's, and the increase of row crops can all impact nitrates in groundwater. A source analysis can determine how each of these sources impact nitrates in groundwater. A source analysis can inform groundwater protection policies by focusing on sources of greatest concern.

A nitrate source analysis is ~\$220/sample. A county-wide nitrate source analysis study should sample 100 drinking water wells. The projected cost for this project is ~\$22,000.

#### Free Water Quality Screening Clinics

CDD is developing the framework for hosting free drinking water quality screening clinics. CDD has purchased an YSI ProDSS Multiparameter Water Quality Meter. County staff will use the meter at water quality screening clinics. Nitrates will be tested for anyone who brings in a water sample. Groundwater and well education materials will be available for well owners. Water test kits for Eau Claire, Stevens Point or Colfax labs may be available for well owners whose screening results indicate the need for further nitrate testing.

Screening results will be captured using a CDD iPad and immediately entered into the CDD well testing database by the well owner if the owner so chooses. If the well owner does not want their test results shared, the results will not be entered into the database. Well owners could also bring in prior well test results to add to the CDD database.

The goal(s) of the water quality screening clinics are:

- Increase participation in drinking water well testing.
- Offer free water quality screening and use as an education opportunity.
- Help rural homeowner make informed decisions about their drinking water quality.
- Add to our drinking water test database to determine if more thorough baseline testing is required.

#### Drinking Water Quality Mapping

St. Croix County staff will develop a series of maps using the water quality testing results and the water quality screening results to display St. Croix County water quality trends related to nitrates and any changes detected in



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the level of nitrates. These maps will be hosted and displayed on the county website supported through existing staff and land information budgets.

#### Summary of Costs

Baseline Water Quality Analysis			
<b>Baseline Water Quality Analysis (Nitrates and bacteria) *Repeat Same Wells Once every 5-years</b>	\$50/test	200/year 1,000/5 years *Repeat	\$10,000 per year \$50,000 over 5 years \$100,000 over 10 years
<b>Baseline water quality testing program Water Quality Screening GW-Staff &amp; GIS-Staff \$40/hr</b>		0.5 FTE existing staff	\$45,000
<b>Nitrate Source Analysis</b>	\$220/sample	100 samples	\$22,000
<b>Mobile Water Quality Screening Lab Equipment</b>		CDD Purchased 2017	\$8,773 Grant Funded
<b>TOTALS</b>			\$55,000/year \$22,000 One time Nitrate Source Analysis

#### *Priority 2. Identify and map environmentally sensitive areas and conduits to groundwater to improve siting of POWTS, wells, manure spreading, etc.*

##### A. Sinkhole Identification & High Resolution Land Cover Mapping

This project will create a high-resolution land cover classification and map sinkhole locations for St Croix County, WI. The project will employ an object-based image analysis and sinkhole mapping approach using leaf-off imagery, leaf-on imagery, and LiDAR data, acquired in 2014 and 2015 with ancillary vector datasets to map land cover classes and sinkholes. The land cover classes mapped will include tree canopy, shrub, grassland, agriculture, wetland, barren, impervious, and water. The resulting land cover classification will be used with lidar-derived surface and topographic models to map sinkhole locations. The results of these analyses will include map layers and documents with land cover classes and sinkhole locations for the extent of the county. These analyses will be summarized by geographies such as parcel boundaries as defined by St Croix County.

The deliverables for this project are as follows:

- Lidar-derived surface models: normalized digital surface model (nDSM), normalized digital terrain model (nDTM), canopy height model (CHM), topographic position index (TPI), and any other surface models used for sinkhole mapping.
- 8-class, high-resolution (1m) land cover layer
- Sinkhole layers with the location and extent of each sinkhole.
- Report and map layers summarizing methods, analyses, and results.
- Metadata for each layer.

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The land cover and sinkhole mapping from this remote sensing project will be used to identify environmentally sensitive areas and conduits to groundwater. Sinkhole locations will be provided to the state for inclusion in SnapPlus and incorporated into farm nutrient management plans

St. Croix County is collaborating with USFWS-St. Croix Wetland Management District on this project. St. Croix County's projected cost is \$20,950. The funding is available and the project is moving forward.

#### Map Karst Surface Features

Starting with the sinkhole data from the sinkhole identification project, begin to collect other surface data related to karst topography and develop a GIS database of sinkholes, springs, and stream sinks. The St. Croix County Karst Feature dataset will be continuously updated as more karst related surface features are identified.

Groundwater flow through local karst aquifers, in central St. Croix County is not well simulated in the USGS Groundwater Flow Model. The groundwater flow model final report suggests that simulation of groundwater flow through the karst aquifer in St. Croix County would most likely be improved with further karst investigation. The karst surface features will be used in the study of local karst aquifers to provide data to likely improve the groundwater flow model.

The karst feature map may be used to regulate land use in order to protect groundwater resources.

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#### **Update Hydrologic Data & Calibrate the USGS Groundwater Flow Model**

In 2009 the US Geological Survey (USGS) published a regional three-dimensional groundwater-flow model and three associated demonstration inset models. The model(s) simulate the groundwater-flow system in the three-county area that includes St. Croix, Polk and Pierce counties. The model was developed by the U.S. Geological Survey in cooperation with the three county governments. The objectives of the regional model of Pierce, Polk, and St. Croix counties were to improve understanding of the groundwater flow system and to develop a tool suitable for evaluating the effects of potential water-management programs.

However, these models could be enhanced to address specific questions through the collection or compilation of additional hydrologic data and by calibration of the models to address the stated purpose. Simulation of groundwater flow through karst aquifers in the St. Croix County model would most likely be improved with data from karst mapping and better understanding of local groundwater flow in karst aquifers.

This project incorporates the karst feature mapping and other enhanced data collection into a more highly calibrated groundwater flow model calibrated to answer specific questions. Due to the nature of underground karst features it is unlikely the groundwater flow model will be precise enough to answer where does a pollutant in a well originate from.

This project requires technical assistance from the USGS and Wisconsin Geological and Natural History Survey (WGNHS). The estimated cost for completing further study of groundwater flow in karst aquifers and calibrating the groundwater flow model is \$75,000 to \$150,000 depending on the parameters of the study.

#### **Identify Groundwater Recharge Areas & other groundwater environmentally sensitive areas.**

The karst feature dataset, soils, depth to bedrock, wetlands, groundwater flow model and any other important environmental data layer will be used to create a groundwater recharge area map and groundwater sensitivity map. The groundwater recharge map may be used to regulate land use.

#### **EVAAL Study for Kinnickinnic Watershed**

The Wisconsin Department of Natural Resources Bureau of Water Quality has developed the Erosion Vulnerability Assessment for Agricultural Lands (EVAAL) toolset to assist watershed managers in prioritizing areas within a watershed which may be vulnerable to water erosion (and thus increased nutrient export) and therefore may contribute to downstream surface water quality problems. It evaluates locations of relative vulnerability to sheet, rill and gully erosion using information about topography, soils, rainfall and land cover. This tool enables watershed managers to prioritize and focus field-scale data collection efforts, thus saving time and money while increasing the probability of locating fields with high sediment and nutrient export for implementation of best management practices (BMPs).

MSA Professional Services completed an EVAAL analysis for the Willow River Watershed as part of the Highway 64 Communities Stormwater-Wastewater study activities. Watershed managers in the implementation of the Willow and St. Croix River TMDL may use the analysis. MSA has provided a cost estimate of \$12,000 for completing EVAAL analysis for the Kinnickinnic River Watershed.

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**Summary of Costs**

Identification & Mapping of Groundwater Recharge & Flow Patterns			
Sinkhole Identification and High Resolution Land Cover Mapping		Consultant	\$21,000 Funded
Groundwater Flow Model Local Groundwater Flow in Karst Aquifers		Consultant	\$75,000
Identify and Map Groundwater Recharge Area		Consultant	\$75,000
EVAAL Study for Kinnickinnic Watershed		Consultant	\$12,000
TOTALS			\$183,000

***Priority 3. Groundwater & Surface Water Protection, Coordination, Education, & Outreach***

- A. Create and support necessary staff positions to carry out the priority recommendations.**

CDD is requesting to reclassify an existing staff position as Water Resources/Marketing Specialist. The position will be the project coordinator for the drinking water well testing program and be responsible for coordinating resources to accomplish the tasks associated with the priority recommendations. The position will be the point of contact for groundwater education, outreach and emergency response. Reclassification of the existing position will be an increase of approximately \$13,000 for salary and benefits.

- B. Develop a county protocol for urgent response to actual or potential water-resource pollution events that threaten human health, the environment, or natural resources.**

CDD is proposing to use the SCC-Alert System to notify residents of potential water resource pollution events. SCC-Alert is a free to user mass alert system offered by St. Croix County Emergency Support Services. Alerts can be sent to residents based on geographic location. The service will be publicized to local residents residing in locations susceptible to water resource pollution events. The user must register themselves to receive the alerts.

Protocol will be established to determine what constitutes a water resource pollution event.

- C. Emergency Response Bacteria Testing**

Public Health and CDD will create an emergency response drinking water well testing program for bacteria in response to brown-water events.



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### D. Summary of Costs

Groundwater Protection Education & Outreach			
CDD Staff		0.6 FTE	~\$53,000 annually
Emergency Response Bacteria Testing Variable According to Weather	\$15/test	20 tests per event	\$300 per event

#### *Priority 4. Increase the number of acres in nutrient management plans (NMPs)*

The steps to increase the number of acres in nutrient management plan include:

- Increase enrollment in Farmland Preservation Zoning thereby requiring NMPs.
- Continually educate and encourage producers to create nutrient management plans.
- Increased participation in NMP program will require increase of cost share dollars.

The primary resource required to implement the above steps, to increase enrollment in Farmland Preservation Zoning, is additional land & water conservation staff. Increase of land enrolled in Farmland Preservation Zoning is dependent on more agricultural towns choosing Farmland Preservation Zoning. Staff would be responsible for technical assistance to producers, education, and implementing BMP's.

Increase Acres in Nutrient Management Plans		
Technical Assistance to Producers	1 New FTE	\$90,000 annually

#### *Priority 5. Revise the County's land use policy and zoning ordinances to protect groundwater resources.*

##### **A. Separate incompatible land uses and/or varying lot size requirements in environmentally sensitive area.**

As an example, the comprehensive revision zoning ordinance project proposes to split the existing Rural Residential District into two districts, reflecting major plat subdivision based rural development and scattered isolated rural residential development at a lower density. The separation of these uses will minimize land use conflicts and reduce the potential for and exposure to groundwater contamination through lower residential density development in some areas of the county where zoning and town future land use desires allow.

The identification of environmentally sensitive areas and important groundwater recharge areas in karst aquifers will play a future role in determining, landuse, future residential density and lot size.

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#### **B. Update county soil and erosion control ordinances.**

St. Croix County is in the process of updating these ordinances. The county must meet statutory and administrative rule standards and in most cases cannot regulate beyond state standards. Changes to legislation and administrative rule may be required for the county to regulate beyond state standards. Advocating at the state level to allow local regulation to exceed state standards would need to be pursued by the County Board.

Of particular interest is NR 151 Runoff Management. NR 151 contains performance standards for Silurian Bedrock that exceed general state standards. Silurian Bedrock is the type of karst found in eastern Wisconsin at shallow depth to bedrock. Advocating at the state level to include all karst areas for higher performance standards would need to be pursued by the county board.

#### **Encourage common POWTS and shared wells constructed to a higher standard.**

Review conservation design subdivision standards, work to incentivize the use of common POWTS and common wells to achieve a higher level of construction and treatment. Individual POWTS and wells in the county should also be encouraged to be constructed to a higher standard.

Nitrate removal technology for private onsite wastewater treatment system (POWTS) effluent does exist. However, the County cannot regulate beyond state minimum standards. Advocating at the state level to allow local regulation to require POWTS to treat nitrates to a higher standard would need to be pursued by the County Board. The installation of nitrate treatment on POWTS would add \$7,000-\$10,000 to the installation of a POWTS.

#### **Adoption of Agricultural Shoreland Management Ordinance**

Agricultural activities conducted in close proximity to surface waters can pollute local surface and ground water resources. When not properly managed activities such as, fertilizer and pesticide use, tillage, irrigation, drain tile, riparian grazing, confined feeding operations, and manure management can impact water quality. Contaminated water can adversely affect human and animal health through exposure to chemicals, bacteria, viruses and sediment.

An agricultural shoreland management ordinance would complement the County's Shoreland and Floodplain Overlay Zoning Ordinances, to regulate activities within designated agricultural shoreland corridors. These corridors would include areas within 35 feet of the edge of a sinkhole, centerline of an intermittent stream, top of either bank of a perennial stream or river, or the ordinary high water mark of any pond or lake.

The review of applicability and cost benefit of implementing these regulations will not occur until mid-year 2022. Additional CDD Staff would be required for administering the agricultural shoreland management ordinance.

#### **Adopt County Administration of Private Well Code under NR 845.05**

Explore options for adopting each of five levels of authority for regulating well design and construction, as specified in NR 845.05; and, exploring options to update well construction standards, including casing, depth, grouting and well casing down to water source, as well as improving data quality. Well construction standards are set by the state in NR 845.05. In most cases the county cannot regulate beyond the state minimum standards. Advocating at the state level for higher well construction standards for well casing and grouting would need to be pursued by the county board.

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Drinking water treatment systems are also an alternative. Water treatment systems with reverse osmosis, nitrate removal and UV bacteria treatment are available and should be encouraged. Advocating at the state level for construction standards to include these water treatment systems would need to be pursued by the county board.

Tasks associated with county administration of private well code:

- Scoping meetings with Public Health, HHS, CDD, CDC and Corporation Counsel
- Drafting & Adoption
- 50 Hours of various staff time
- Implementation and Enforcement

The review of applicability and cost benefit of implementing these regulations will not occur until mid-year 2024. Additional Public Health or CDD Staff would be required for administering the private well code.

### Summary of Costs

Revise County Land Use Policies		
<b>Revise Policy and Ordinances Existing Staff</b>	200 hours over 18 mo.	\$8,000
<b>Agricultural Shoreland Management Ordinance Enforcement</b>	1 New FTE	\$90,000 annually
<b>Administration of Well Code</b>	1 New FTE	\$90,000 annually
<b>TOTALS</b>	2 New FTE Ordinance Development	\$180,000 annually \$8,000

*Priority 6. Explore options regarding the regulation of livestock operations and licensing, for facility siting for ongoing monitoring of livestock operations for the purpose of protecting water resources.*

#### A. Agriculture Operations Ordinance – County-wide – Existing Chapter 11 Waste Storage & Waste Utilization

- Evaluate existing ordinance and alternatives, Recommend Edits and Expansion, Legal Review, Public Information Meeting
- Regulate spreading and setback requirements
- Regulate based on Karst Topography
- Regulate winter spreading based on TMDL
- Regulate based on storage capacity
- Set a manure tank cubic feet capacity requirement. Therefore, if a manure tank were above this cubic foot capacity threshold then a permit would be required. This would provide more clarity on when permits are needed.
- Increase the application fee and/or create an application fee system based off the number of animal units owned by the permit applicant.

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**B. Siting Licensing Ordinance – County-wide – Editing and Expanding Chapter 17 Zoning**

- Evaluate existing ordinance and alternatives, Recommend Edits and Expansion, Legal Review, Public Information Meeting
- >1 Animal Unit/Acre and >500 Animal Unit
- Annual Compliance Review
- Limit zoning districts (Rural Residential, Ag1 & Ag2)

The review of the applicability and cost benefit of implementation of these regulations will not occur until mid-year 2024.

**C. Summary of Costs**

These ordinances will require additional implementation and enforcement activities involving Community Development and Corporation Counsel staff.

Livestock Operations & Licensing Ordinances & Enforcement		
Operations & Licensing Ordinance Development	500-750 hours over 6 mo.	\$20,000 - 30,000
Implementation & Enforcement New Staff	1 New FTE CDD 1 New FTE Legal	\$220,000 annually
<b>TOTALS</b>		<b>\$240,000 – \$250,000</b>

*Priority 7. Establish active water quality committee to ensure that the protection of ground and surface water continues to be a priority issue actively addressed by the County.*

CDD and HHS believe that the respective committees fulfil this role. The committees should schedule quarterly joint meetings or work sessions to address groundwater and surface water issues.